S
333.955
E30aifs
2002

MONTANA STATE LIBRARY
3 0864 1002 0288 9

AQUATIC INVERTEBRATES AND HABITAT AT A FIXED STATION ON THE NORTH FORK OF THE FLATHEAD RIVER, FLATHEAD COUNTY, MONTANA

August 7, 2001

A report to
the Montana Department of Environmental Quality
Helena, Montana

by

Wease Bollman
Rhithron Associates, Inc.
Missoula, Montana
May 2002

INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the North Fork of the Flathead River near Columbia Falls, Montana on August 7, 2001. The sample site was located by GPS reading at 48° 29' 36" N, 114° 07' 31" W, lying within the Montana Valley and Foothill Prairie Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of a composite of five Hess samples. Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. For example, 21 of the riverine or high-order waterways sampled for the fixed station study were located within the Montana Valley and Foothill Prairies Ecoregion (MVFP) and were sampled between July 23 and August 25, 2001. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Ninety-eight sites from the MVFP were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures; impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix.

RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions were judged optimal, although marginal flow conditions were reported. Evaluation notes indicate that flow was estimated to be about 65% of normal. (Contrarily, field comments describe "good flow.") Notes record the observation that areas of near-shore slow-moving water were covered with a thin layer of fine sediment. However, instream flowing-water habitats were perceived to be unaffected by sediment deposition; instream habitat parameters were all assigned optimal scores.

Streambank and riparian zone parameters were likewise judged to be unimpaired by human activities.

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the North Fork of the Flathead River is slightly impaired and only partially supports designated uses.

Table 1. Stream and riparian habitat assessment for a fixed station on the North Fork of the Flathead River. August 2001.

Max. possible score	**Parameter**	North Fork of the Flathead River near Columbia Falls
10	Riffle development	10
10	Benthic substrate	9
20	Embeddedness	19
20	Channel alteration	20
20	Sediment deposition	18
20	Channel flow status	10
20	Bank stability: left / right	9 / 9
20	Bank vegetation: left / right	10 / 10
20	Vegetated zone: left / right	10 / 10
160	Total	144
	Percent of maximum CONDITION*	**90** **OPTIMAL**

*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%, Marginal 49 - 29%; Poor <23%. Adapted from Plafkin et al. 1998.

Table 2. Metric values, scores, and bioassessment for a fixed station on the North Fork of the Flathead River. August 2001.The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. August 2001.

	North Fork of the Flathead River near Columbia Falls	
METRICS	**METRIC VALUES**	**METRIC SCORES**
Ephemeroptera richness	6	3
Plecoptera richness	4	3
Trichoptera richness	3	2
Number of sensitive taxa	2	2
Percent filterers	26.8	0
Percent tolerant taxa	1.41	3
	TOTAL SCORE (max.=18)	13
	PERCENT OF MAX.	**72**
	Impairment classification	**SLIGHT**
	USE SUPPORT	**PARTIAL**

Low abundance of organisms in the sample (only 71 animals were collected) complicates the evaluation, conclusions and interpretation of results are tenuous. Whether the inadequacy of the sample was due to a depauperate community at the site or to sampling bias is not clear from the data. However, there were enough animals present to permit some speculative observations about the fauna.

The presence of 6 mayfly taxa, including the sensitive cold-stenotherms ephemerellids *Drunella doddsi* and *Drunella spinifera*, and a low biotic index value (3.03) suggest that water quality was good and water temperature was cold at this site on the North Fork. Four stonefly taxa were collected, suggesting that reach-scale habitat features were essentially intact at the site. Scrapers were underrepresented in the sample, but all other expected functional components of a health benthic assemblage were present.

CONCLUSIONS

- Low abundance of organisms in the sample renders scores, classifications, and interpretations based on the invertebrate community tenuous and unreliable.
- A rich mayfly fauna suggests that water quality was excellent at this site; two taxa of cold stenotherms were common in the sample.
- A rich stonefly taxa suggests that reach-scale habitat conditions were unimpaired by human activities.

LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia. US Geological Survey.

APPENDIX

Taxonomic data and summaries

North Fork Flathead River near Columbia Falls

August 2001

Aquatic Invertebrate Taxonomic Data

Site Name: NF Flathead River near Columbia Falls **Date: 8/07/01**
Site ID: C06NFKFR01 Approx. percent of sample used: 100

Taxon	Quantity	Percent	HBI	FFG
Acentrella insignificans	2	2.82	4	CG
Baetis tricaudatus	1	1.41	4	CG
Diphetor hageni	1	1.41	5	CG
Drunella doddsi	6	8.45	1	CG
Drunella spinifera	4	5.63	0	PR
Rhithrogena sp.	6	8.45	0	CG
Total Ephemeroptera	**20**	**28.17**		
Calineuria californica	5	7.04	2	PR
Claassenia sabulosa	3	4.23	3	PR
Hesperoperla pacifica	1	1.41	2	PR
Pteronarcys californica	4	5.63	1	SH
Total Plecoptera	**13**	**18.31**		
Brachycentrus americanus	1	1.41	1	CF
Glossosoma sp.	1	1.41	0	SC
Hydropsyche sp.	16	22.54	5	CF
Total Trichoptera	**18**	**25.35**		
Chelifera sp.	6	8.45	5	PR
Hexatoma sp.	2	2.82	2	PR
Total Diptera	**8**	**11.27**		
Micropsectra sp.	10	14.08	4	CG
Microtendipes sp.	1	1.41	6	CF
Rheotanytarsus sp.	1	1.41	6	CF
Total Chironomidae	**12**	**16.90**		
Grand Total	71	**100.00**		

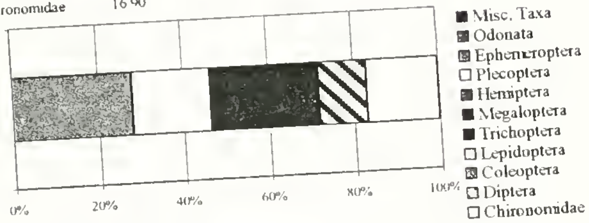
Aquatic Invertebrate Summary

Site Name: NF Flathead River near Columbia Falls **Date: 8/07/01**

SAMPLE TOTAL	71
EPT abundance	51
TAXA RICHNESS	18
Number EPT taxa	13
Percent EPT	71 83

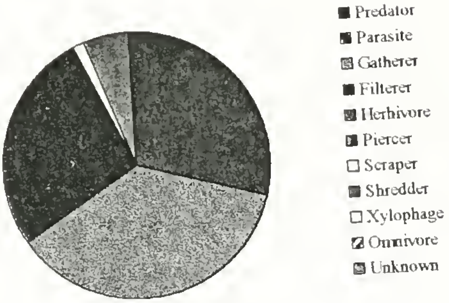
TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc Taxa	0 00	0	0
Odonata	0 00	0	0
Ephemeroptera	28 17	6	20
Plecoptera	18 31	4	13
Hemiptera	0 00	0	0
Megaloptera	0 00	0	0
Trichoptera	25 35	3	18
Lepidoptera	0 00	0	0
Coleoptera	0 00	0	0
Diptera	11 27	2	8
Chironomidae	16 90	3	12



FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	29 58	6	21
Parasite	0 00	0	0
Gatherer	36 62	6	26
Filterer	26 76	4	19
Herbivore	0 00	0	0
Piercer	0 00	0	0
Scraper	1 41	1	1
Shredder	5 63	1	4
Xylophage	0 00	0	0
Omnivore	0 00	0	0
Unknown	0 00	0	0



COMMUNITY TOLERANCES

Sediment tolerant taxa	1
Percent sediment tolerant	2 82
Sediment sensitive taxa	1
Percent sediment sensitive	1 41
Metals tolerance index (McGuire)	3 05
Cold stenotherm taxa	2
Percent cold stenotherms	14 08

Site ID: C06NFKFR01

DOMINANCE

TAXON	ABUNDANCE	PERCENT
Hydropsyche sp	16	22 54
Micropsectra sp	10	14 08
Drunella doddsi	6	8 45
Rhithrogena sp	6	8 45
Chelifera sp	6	8 45
SUBTOTAL 5 DOMINANTS	44	61.97
Calineuria californica	5	7 04
Drunella spinifera	4	5 63
Pteronarcys californica	4	5 63
Claassenia sabulosa	3	4 23
Acentrella insignificans	2	2.82
TOTAL DOMINANTS	62	87 32

SAPROBITY

Hilsenhoff Biotic Index	3 03

DIVERSITY

Shannon H (loge)	2 50
Shannon H (log2)	3 61
Simpson D	0 10

VOLTINISM

TYPE	ABUNDANCE	PERCENT
Multivoltine	16	22 54
Univoltine	41	57 75
Semivoltine	14	19 72

TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	1	1	1 41
Intolerant	2	10	14 08
Clinger	8	43	60 56

BIOASSESSMENT INDICES

B-IBI (Karr et al)

METRIC	VALUE	SCORE	
Taxa richness	18	1	
E richness	6	3	
P richness	4	3	
T richness	3	1	
Long-lived	0	1	
Sensitive richness	2	1	
%tolerant	1 41	5	
%predators	29 58	5	
Clinger richness	8	1	
%dominance (3)	45 07	5	
TOTAL SCORE		26	52 %

MONTANA DEQ METRICS (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	18	2	1	0
EPT richness	13	3	2	0
Biotic Index	3 03	3	3	2
%Dominant taxon	22 54	3	3	3
%Collectors	63 38	2	2	2
%EPT	71 83	3	3	3
Shannon Diversity	3 61	3		
%Scrapers +Shredd	7 04	1	0	0
Predator taxa	6	3		
%Multivoltine	22 54	3		
%H of T	89		1	
TOTAL SCORES		26	15	10
PERCENT OF MAXIMUM		86 67	62 50	47 62
IMPAIRMENT CLASS		NON	SLIGHT	MODERATE

Montana DEQ metric batteries